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Title of Invention: Carpet adhesive
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Specifications

1. Title of Invention:

Carpet adhesive

2. Claims:

(1) A carpet adhesive, characterized in that a water repellent with a melting point in the range of 80-100°C is added to an adhesive mixture which contains a high-molecular-weight latex with a solids component of 100 parts by weight and 100-700 parts by weight filler.

3. Detailed Explanation of Invention:

This invention concerns a carpet adhesive.

In tufted carpets or woven carpets, which are typical modern carpets, adhesives are used when the pile which constitutes the carpet is fixed to the scrim to prevent the pile from falling off, or a second base fabric is adhered to the rear surface of the scrim.

On the other hand, a special processing is applied to the pile threads to give them a stain repelling property, so that the carpet will resist stains, or the stains that do adhere to it will be more easily removable.

However, even though the ability to repel small quantities of stains is obtained by such a method, stains which contain large quantities of water, such as coffee, soy sauce, milk, etc., will soak through the scrim of the carpet to its rear surface and stain the second base fabric as well, and it is quite difficult to remove these stains. Furthermore, if such stains are left as they are, great problems arise, including the fact that the beauty of the carpet is harmed and mold or other microorganisms are easily grown.

The inventors performed careful research on this state of affairs; as a result, they discovered that a good water-repellent ability and anti-moisture-absorbing property can be imparted to carpets by using a specific carpet adhesive, i.e., one with a water-repellent property. In this way, they achieved this invention.

The purpose of this invention is to provide a carpet adhesive which can impart a good water-repellent ability and anti-moisture-absorbing property to carpets and make carpets resist staining, or make it easier to remove stains from carpets.

This invention is characterized by the fact that a water repellent with a melting point in the range of 80–100°C is added to an adhesive mixture which contains a high-molecular-weight latex with a solids component of 100 parts by weight and 100–700 parts by weight filler.

This invention will be explained in more detail below.

In this invention, a carpet adhesive is made by adding a water repellent with a melting point in the range of 80–100°C to an adhesive mixture containing a high-molecular-weight latex with a solids component of 100 parts by weight and 100–700 parts by weight filler. If desired, other additives, such as cross-linking agents, cross-linking accelerants, dispersants, aging inhibitors, pigments, stabilizers, foam quenchers, thickeners, etc., can also be added to this mixture.

Examples of the high-molecular-weight latexes used in this invention are natural rubber latex, SBR latex, self-cross-linking SBR latex, NBR latex, self-cross-linking NBR latex, carboxy-modified styrene-butadiene copolymers, polychloroprene latex, acrylic acid ester emulsions, polyethylene-vinyl acetate copolymer emulsions, polyvinyl acetate emulsions, etc., as well as all other latexes which can be added to carpet adhesives. Among them, carboxy-modified

styrene-butadiene copolymers are especially desirable. High-molecular-weight latexes which are especially preferable are those which are obtained by polymerizing the monomers in the presence of 0.03–2 parts by weight, preferably 0.05–1.5 parts by weight, emulsifier and 0.05–0.5 part by weight, preferably 0.07–0.3 part by weight, polymerization initiator per 100 parts by weight of the total monomers, with the product of the quantity of the emulsifier used and the quantity of the polymerization initiator used being less than 0.5, preferably less than 0.3.

When such high-molecular-weight latexes are used, the adhesives obtained do not easily absorb water, and even when water vapor penetrates the adhesive layer of the carpet, the strength of the adhesive layer is not reduced. On the other hand, if the proportions of the emulsifiers and polymerization initiators used in polymerizing the latex are too great, the hydrophilicity [? - hard to read] of the adhesive obtained will become larger and it will more easily absorb water, so that, as a result, the adhesive will swell and the water-repellent ingredient in the adhesive layer will break down, reducing the water-repelling ability of the adhesive. Moreover, the strength of the adhesive layer will be reduced by the absorption of water, and if the adhesive is used between the scrim and the second base fabric, the latter will peel off more easily. Conversely, if the proportions of the emulsifier and polymerization initiator used are too small, phenomena which are undesirable in the polymerization process will be produced; for example, the polymerization stability will be worsened and the polymerization rate will become slower.

Examples of fillers which can be used in this invention are calcium carbonate, aluminum hydroxide, clay, and any other fillers which can be used in carpet adhesives. They are not particularly limited, as long as they can be dispersed stably in the high-molecular-weight latex. The quantity of the filler used is in the range of 100–700 parts by weight per 100 parts by weight of the solids of the high-molecular-weight latex; if it is less than 100 parts by weight, the effectiveness of the filler will not be exhibited, and the adhesive strength will be reduced, and if it exceeds 700 parts by weight, the adhesive strength will be reduced. In either case, the adhesive performance of the adhesive will be lowered.

Examples of the water repellents which can be used in this invention include natural waxes, polyethylene wax, paraffin wax, metal salts, silicon wax, alkyl ethylene ureas, N-methylol fatty acid amides, amino resin [? - hard to read] derivatives, fluorine water repellents, rosin sizing agents, petroleum resins, hydrogenated petroleum resins, etc. These are water repellents which are treated so that they can be dispersed in water. It is necessary for their melting points to be in the range of 30–100°C, preferably 40–100°C, and especially preferably 50–90°C. If their melting points are lower than 30°C, the adhesive part of the carpet will become sticky and dust, etc., will adhere to it easily, which is not desirable. Conversely, if their melting points are higher than 100°C, the adhesive will not melt easily in the process of heating and drying it after it has been applied to the carpet, and the water-repellent property will not be easily imparted to the adhesive. The quantity of

the water repellent used is in the range of 0.2–8 parts by weight, preferably 0.2–6 parts by weight, and especially preferably 0.4–4 parts by weight per 100 parts by weight of the solids of the adhesive mixture consisting of the high-molecular-weight latex, filler, and other additives used, if desired. If this quantity is less than 0.2 part by weight, the necessary water-repellent property will not be imparted, and if it is greater than 8 parts by weight, the adhesive strength of the adhesive layer is reduced.

Among the additives used, if desired, are cross-linking agents, such as zinc oxide, sulfur, epoxy cross-linking agents, melamine cross-linking agents, etc., and dispersants, such as polyphosphates, polycarbonates, condensed naphthalene sulfonic acid sodium salt, etc. The aging inhibitors used are preferably non-polluting ones, e.g., BHT, styrenated phenol, etc. Examples of pigments which can be used are carbon black, iron oxide red, titanium white, etc. Examples of stabilizers which can be used are general anionic and nonionic emulsifiers. The nonionic emulsifiers include polyalkylene oxide nonylphenyl ether, polyalkylene oxide nonyl ether, etc. Examples of foam quenchers which can be used are nonionic emulsifier compounds, silicon compounds, etc. Examples of thickeners are sodium polycarbonates, carboxymethyl cellulose, hydroxyethyl cellulose, etc.

Since the carpet adhesive of this invention is as described above, the adhesive layer has good adhesive strength and a water-repellent property immediately after the adhesive is applied and dried, as can be seen in the working examples given below. Therefore, it can impart good water permeation preventability and resistance to water absorption to carpets, and can make it difficult for stains to adhere to carpets, or make them easily removable if they do adhere to the carpets. For example, when the adhesive of this invention is used for adhering the scrim and the second base fabric together, even stains which contain large quantities of water, such as coffee, soy sauce, milk, etc., can be prevented from passing through the scrim by the water-repellent activity of the adhesive layer, and staining of the second base fabric can be prevented. Furthermore, since these stain substances remain on the surface of the scrim, they can be easily removed by wiping with a cloth, etc.

One of the reasons for these effects being obtained is thought to be that, when the adhesive is heated and dried, the water repellent ingredient is melted and dispersed through the whole adhesive layer, causing the water-repellent property to be imparted to the whole adhesive layer.

Working examples of this invention will be explained below, but this invention is not limited to these examples.

Preparation of high-molecular-weight latexes:

The monomer compositions a–j in Table 1 were charged into respective stainless steel reactors with stirrers attached and polymerization reactions were performed for 30 minutes at a temperature of 45°C. After this, the pH [of each reaction product] was adjusted to 8.0 with sodium hydroxide, and

the high-molecular-weight latexes A-J were obtained.

Since the quantity of the emulsifier in the high-molecular-weight latex I was small, there was a large quantity of solids; the latex was unstable, and it was not suitable for practical use.

Furthermore, since the quantity of polymerization initiator used with the high-molecular-weight latex J was small, the polymer conversion rate was low, and a long time was needed to remove the unreacted monomer, which was not a practical result.

Table 1

Monomer composition	High-molecular-weight latexes									
	A	B	C	D	E	F	G	H	I	J
	a	b	c	d	e	f	g	h	i	j
Butadiene	50	50	50	50	50	50	50	50	50	50
Styrene	47	47	47	47	47	47	47	47	47	47
Acrylic acid	3	3	3	3	3	3	3	3	3	3
n-Dodecylmercaptan	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sodium allylbenzenesulfonate (emulsifier)	0.5	0.5	0.5	1.3	1.3	1.7	1.7	2.5	0.01	2.0
Potassium persulfate (polymerization initiator)	0.6	0.4	0.15	0.25	0.15	0.4	0.15	0.25	0.5	0.03
Sodium hydrogen carbonate	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Demineralized water	100	100	100	100	100	100	100	100	100	100
(Quantity of emulsifier) x (quantity of polymerization initiator)	0.3	0.2	0.075	0.33	0.20	0.68	0.26	0.63	0.005	0.06

Table 1

(Note: The numerical values represent parts by weight.)

Working Examples 1-7 and Comparison Examples 1-4

Carpet adhesives (abbreviated below as "adhesives") were made according to the compositions shown in Table 2. However, water and a thickener "Aron 20 pj" (Toa Gosei Kagaku Kogyo Co.) were added to the adhesives, although this is not shown in the table; in this way, the solids concentration of each adhesive mixture was made 70 wt %. The viscosity, measured at 6 r.p.m. using a Brookfield viscometer, was 25,000 cps. The numerical value of the high-molecular-weight latex H shows the number of parts by weight of the solids; the numerical values of the water repellents in parentheses are the numbers of parts by weight per 100 parts by weight of the solids content of the adhesive mixtures.

Table 2

Table 2												
Composition	Working Examples							Comparison Examples				
	1	2	3	4	5	6	7	1	2	3	4	
High-molecular weight latex H	100	100	100	100	100	100	100	100	100	100	100	
Adhesive composition	350	350	350	350	350	350	350	350	350	350	350	
Calcium carbonate SS-30 (Nitto Funke Kogyo Co.)												
Syrenated phenol (aging inhibitor)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Sodium tripolyphosphate	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Polyethylene wax (melting point: 120°C)	-	-	-	-	-	-	-	22.7 (5.0)	-	-	-	
Water												
Polyethylene wax (melting point: 80°C)	22.7 (5.0)	9.1 (2.0)	0.91 (0.2)	-	-	-	31.7 (7.0)	-	-	-	-	
Paraffin wax (melting point: 70°C)	-	-	-	22.7 (5.0)	9.1 (2.0)	0.91 (0.2)	-	-	-	45.0 (10.0)	0.45 (0.1)	
Test of ability to prevent water permeation immediately after manufacture (minutes)	60	60	15	60	60	15	100	2	2	100	5	
Test of ability to prevent water permeation after being left alone (minutes)	20	15	5	20	15	5	40	1	1	40	2	
Adhesive strength test (kg/5 cm)	2.5	2.8	2.9	2.5	2.8	2.9	2.3	2.5	3.0	1.8	3.0	

(Note: The numerical values represent parts by weight.)

The following experiments were performed with the adhesives obtained in Working Examples 1-7

and Comparison Examples 1-4.

Test of ability to prevent water permeation immediately after manufacture:

The adhesive was applied to the surface of a 1/10 gauge nylon pile carpet with a scrim consisting of polypropylene split yarn; the quantity of adhesive applied was 1.4 g/m². A second base fabric made of jute was laid on this adhesive layer to make the test carpet. This test carpet was dried at 120°C for 20 minutes, using a gear oven. After it was dried, the test carpet was cut into 50 cm square sample pieces, which were held by fixing the corners so that the center part hung down 10 cm below the corners. In this arrangement, 200 ml water were poured in the center part from a high of 30 cm above the center part, and the time required for the water to soak through to the rear surface of the sample, starting from this time, was measured. The results are shown in Table 2.

Test of ability to prevent water permeation after being left alone:

The sample pieces made as described above were left for 1 day in a 25°C/60% RH atmosphere, after which the same "test of ability to prevent water permeation immediately after manufacture" was performed. The results are shown in Table 2.

Adhesive strength test:

The sample pieces made as described above were cut into 5 pieces 5 cm wide and 15 cm long, and the following test was performed on them, following JIS L-1021.

The adhered material was peeled for 5 cm from the long side. Then, the peeled material and the other base cloth were pulled with an autograph (Hitachi Seisakusho Co., [illegible] 500) at a rate of 100 mm per minute and the adhesive strength was continuously plotted. Three values were taken from the larger ones and 3 from the smaller ones; these values were averaged. The same test was performed on 5 test pieces, and these 5 mean values were again averaged to give the result. These results are shown in Table 2.

As can be seen from the results of these tests, when the adhesives obtained from Working Examples 1-7 were used, excellent performances were shown, whereas, when the adhesive obtained from Comparison Example 1 was used, the fact that the water repellent had a high melting point, 120°C, made the water-repellent property very inferior, and when the adhesive obtained from Comparison Example 2 was used, also, the water-repellent property was very bad, since there was no water repellent in the adhesive.

Working Examples 8-15

Adhesives were made in the same manner as in Working Example 1, except that the compositions of the high-molecular-weight latexes and water repellent shown in Table 3 were used. The same

experiments as described above were performed using these adhesives, and the results are shown in Table 3.

Table 3

		Working Examples							
		8	9	10	11	12	13	14	15
Kind of high-molecular-weight latex		A	B	C	D	E	F	G	H
Water repel- lent	Paraffin wax (melting point: 80°C)	9.1 (2.0)	9.1 (2.0)	9.1 (2.0)	9.1 (2.0)	9.1 (2.0)	9.1 (2.0)	9.1 (2.0)	9.1 (2.0)
Test of ability to prevent water permeation immediately after manufacture (minutes)		60	50	60	60	60	60	60	60
Test of ability to prevent water permeation after being left alone (minutes)		15	40	55	40	55	20	35	80
Adhesive strength test (kg/5 cm)		2.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8

(Note: The quantity of the high-molecular-weight latexes A–H used was 100 parts by weight; the quantity of the paraffin wax used is shown in parts by weight. The numerical values in parentheses are the numbers of parts by weight per 100 parts by weight of the solids of the adhesive mixture.) As can be seen from these results, when the adhesives obtained in Working Examples 8–15 were

used, excellent water-repellent properties and adhesive strengths were obtained. It was also found, from the results of the test of the ability to prevent water permeation after being left alone, that better performances were shown the smaller were the quantities of polymerization initiator and emulsifier that were used in manufacturing the high-molecular-weight latexes used. In Working Examples 9-12 and 14, in particular, the quantity of the polymerization initiator used was less than 0.5 part by weight, the quantity of the emulsifier used was less than 2 parts by weight, and the product of these ingredients was less than 0.5 part by weight. When high-molecular-weight latexes made under these conditions were used, the water permeation prevention of the adhesive after it was left alone was markedly improved.

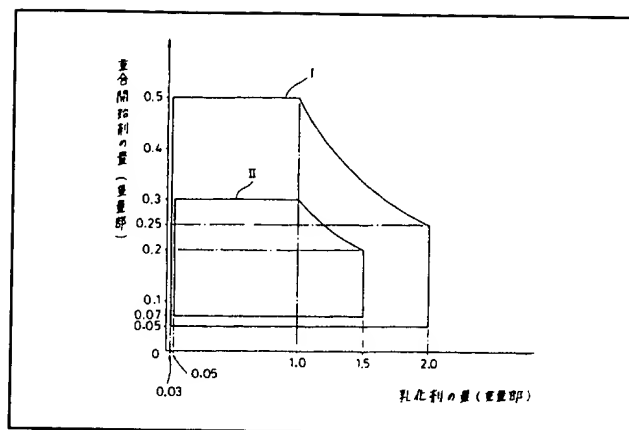
Fig. 1 shows the desirable ranges of the quantities of polymerization initiator and emulsifier to be used in manufacturing the high-molecular-weight latex; curve I shows the limits of the desirable range, and curve II shows the limits of an especially desirable range. The numerical values in both cases are the numbers of parts by weight per 100 parts by weight of the total monomers.

4. Simple Explanation of Drawing:

Fig. 1 shows the desirable ranges of the quantities of polymerization initiator and emulsifier to be used in manufacturing the high-molecular-weight latex.

Agent: Masahiko Oi, Patent Attorney

Fig. 1



- a. Quantity of polymerization initiator (parts by weight) b. Quantity of emulsifier (parts by weight)